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A new species of *Stenchaetothrips* (Thysanoptera, Thripidae) from Bamboo, based on morphological and molecular data

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Abstract

Stenchaetothrips martini sp.n. is distinguished from related species on morphological and molecular character states. It is the eleventh species in this genus to be recorded from a species of bamboo, but only the fourth of these 11 species to have a prominent spinula on the mesothoracic furca. Described here from New Zealand, this thrips is presumably introduced from Southeast Asia, together with its host plant, *Phyllostachys aurea*.

Key words: New Zealand, mesothoracic furca, coxal microtrichia, Poaceae, Bambusoideae

Introduction

The purpose here is to describe a new species of thrips that has been discovered in New Zealand, although the plant on which the population was living is native to Southeast China. This plant, *Phyllostachys aurea*, is commonly known as fishpole bamboo, walking stick bamboo or Golden bamboo. It is considered the most common bamboo grown in the USA, and is introduced and naturalised in many countries, being well established in eastern Australia. In New Zealand it is widely planted in both the North and the South Islands, and as is typical of so many weedy plants, it invades disturbed, neglected land where it can form dense stands. It is widely advertised for sale by commercial garden suppliers, and the associated thrips species reported here from New Zealand is thus likely to be found established in other countries. This thrips has also been reported from Britain (Collins 2010) but was misidentified as *S. spinalis* Reyes, and that record involved a very similar bamboo of the genus *Pleioblastus*.

The genus *Stenchaetothrips* currently includes 41 species (ThripsWiki 2017), all apparently living only on various species of Poaceae. Although all *Stenchaetothrips* species originated in the Palaeotropics, particularly Southeast Asia, a few of them, including the Rice Thrips, *S. biformis*, have been widely distributed including into the Neotropics (Vierbergen 2004). Eleven of the 41 species have been described from plants identified as “bamboo” (Table 1), a group-name that involves at least 60 genera and several hundred species within the family Poaceae (Mabberley 1990). Amongst these 11 thrips species, only the original description of *S. bambusicola* included a named host plant, *Bambusa arnhemica*. However, Ng and Mound (2015) provided the following host records for three *Stenchaetothrips* species collected in Malaysia: *S. bambusicola* from *Schizostachyum zollongeri*; *S. bambusae* from *Bambusa* sp.; *S. spinalis* from *Bambusa* sp., *Dendrocalamus asper*, and *Gigantochloa albociliata*. These plants are all considered members of the Bambusoideae, a subfamily of the Poaceae that is sister group to subfamily Pooideae that includes the majority of grass genera and species.

Among the 41 species of *Stenchaetothrips*, only seven are reported as having a furcal spinula on the mesothoracic sternum. Four of these seven are reported from various grasses, and three from bamboo. Bhatti (1982) noted that presence of this furca is rare in *biformis*, the rice thrips, and recent examination of specimens of *biformis* in the Australian National Insect Collection has found that a very weakly indicated mesothoracic furca is present in a few individuals from several countries. For *tenebricus*, Bhatti stated that the furca was present in two female and one male paratypes, but weak in a third female paratype, although Ananthakrishnan in describing

tenebricus from grasses had stated that the furca was “distinctly absent”. A third species in this group, *S. karnyianus*, has fore wings uniformly brown as in *biformis*, and a fourth species, *brochus*, has prominent microtrichial teeth posterolaterally on the tergites. The remaining three species for which a mesothoracic furca is reported were all taken from bamboo. The holotype and one available paratype of *spinalis* from the Philippines have been studied, and both of these females have the mesothoracic spinula well developed. Similarly for *spinulae*, both sexes were described from India with such a spinula. The original description of *spinalis* states of the metanotum “campaniform sensilla present”; however, these sensilla are **not** present, neither on the holotype nor the paratype (see holotype image on ThripsWiki 2017). Similarly, the metanotum of *spinulae* was both described and illustrated as lacking a pair of campaniform sensilla. The new species described below is a further *Stenchaetothrips* species living on the leaves of a bamboo, and that has a mesothoracic furca present in both sexes. However, all available specimens of both sexes of this species have a pair of metanotal campaniform sensilla, in contrast to both *spinalis* and *spinulae*. The third species from bamboo, *gaomiaensis* from southern China, is similar in structure to the new species described below, but has dark brown males (Zhang & Feng 2017). Full nomenclatural details about *Stenchaetothrips* species are available in ThripsWiki (2017).

TABLE 1. *Stenchaetothrips* species reported from “bamboo”.

Species	Distribution
<i>S. bambusae</i> (Shumsher)	Myanmar [+India; Malaysia]
<i>S. bambusicola</i> Mound	Northern Australia [+Malaysia]
<i>S. banghonensis</i> Hu & Feng	China, Yunnan
<i>S. basibruneus</i> Wang	Taiwan, Taipei
<i>S. dentatus</i> Masumoto & Okajima	Japan, Honshu
<i>S. dissidens</i> Ananthakrishnan & Jagadish	India, Madras
<i>S. gaomiaensis</i> Zhang & Feng	China, Sichuan
<i>S. hupingsshanensis</i> Man & Feng	China, Hunan
<i>S. martini</i> sp.n.	New Zealand, Europe (exotic introduction)
<i>S. spinalis</i> Reyes	Philippines, Luzon [+Malaysia]
<i>S. spinulae</i> Tyagi & Kumar	India, Delhi

Stenchaetothrips martini sp. n.

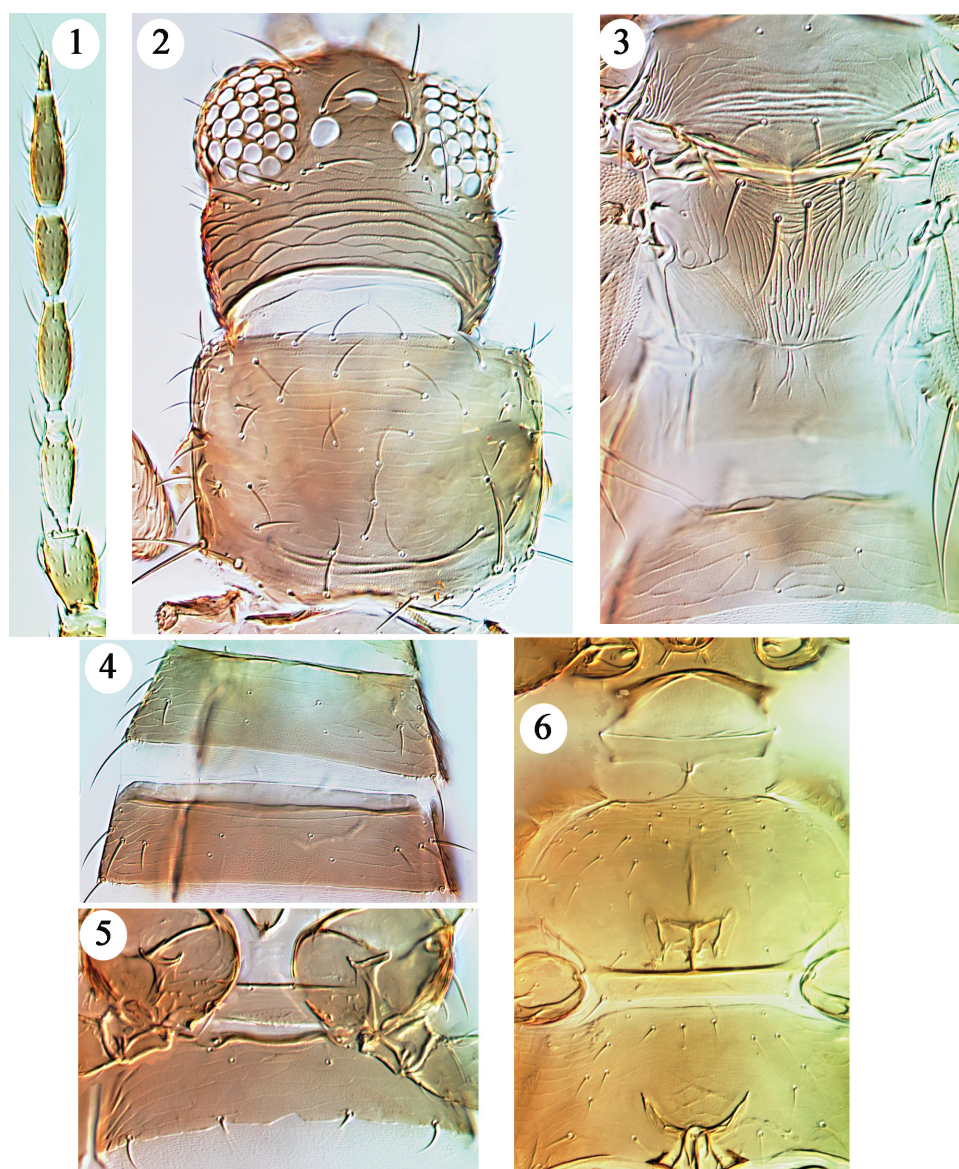
Female macroptera. Body generally brown, with head and thorax slightly paler than abdomen (particularly after clearing for slide-mounting); legs mainly yellow but all femora weakly shaded with light brown; major setae brown; antennae mainly brown but III almost yellow; eyes with no pigmented facets; fore wing pale in basal fourth, then light brown but often again paler near apex. Antennae 7-segmented (Fig. 1), segment I with no dorso-apical setae; II with microtrichia on dorsal sculpture lines; III and IV with apices slightly narrowed, each bearing a short forked sense cone. Head slightly wider than long, cheeks rounded; ocellar setae III scarcely as long as distance between posterior ocelli, arising just outside anterior margins of triangle (Fig. 2); ocellar setae II and postocular setae III sub-equal, both longer than postocular setae I; setae II and IV shorter than V; ventral eye facets slightly larger than dorsal facets. Pronotum with transverse lines of sculpture (Fig. 2), 2 pairs of long posteroangular setae, 3 pairs of posteromarginal setae. Mesonotal campaniform sensilla present (Fig. 3), median setal pair in front of posterior margin. Metanotum closely striate, median setal pair not at anterior margin, paired campaniform sensilla present (Fig. 3). Fore wing first vein with 3 distal setae; second vein with 10–14 setae; clavus with 5 veinal and one discal seta. Prosternal ferna complete medially (Fig. 6); mesofurca with spinula usually prominent but sometimes weak, metafurca with no spinula. Hind coxa upper surface with 5 to 10 microtrichia on sculpture lines (Fig. 5). Tergite II with 4 lateral marginal setae (Fig. 4) (anterior seta sometimes reduced); tergites usually with a weak sculpture line between median setal pair, but no lines posterior to this; posterolateral margins of tergites with 1–4 variably weak triangular craspedal microtrichia (Fig. 4); V–VIII with paired ctenidia, on VIII posteromesad to the spiracle; VIII with complete comb (Fig. 7); IX with 2 pairs of campaniform sensilla, median dorsal setae stout, usually extending to or even beyond posterior margin. Sternites and pleurotergites with no discal

setae; sternite II with 2 pairs of posteromarginal setae, III–VII with 3 pairs, median pair on VII arising in front of margin; sternite I with two minute setae on anterior margin, sternite II with three pairs of minute setae on anterior half (Fig. 5).

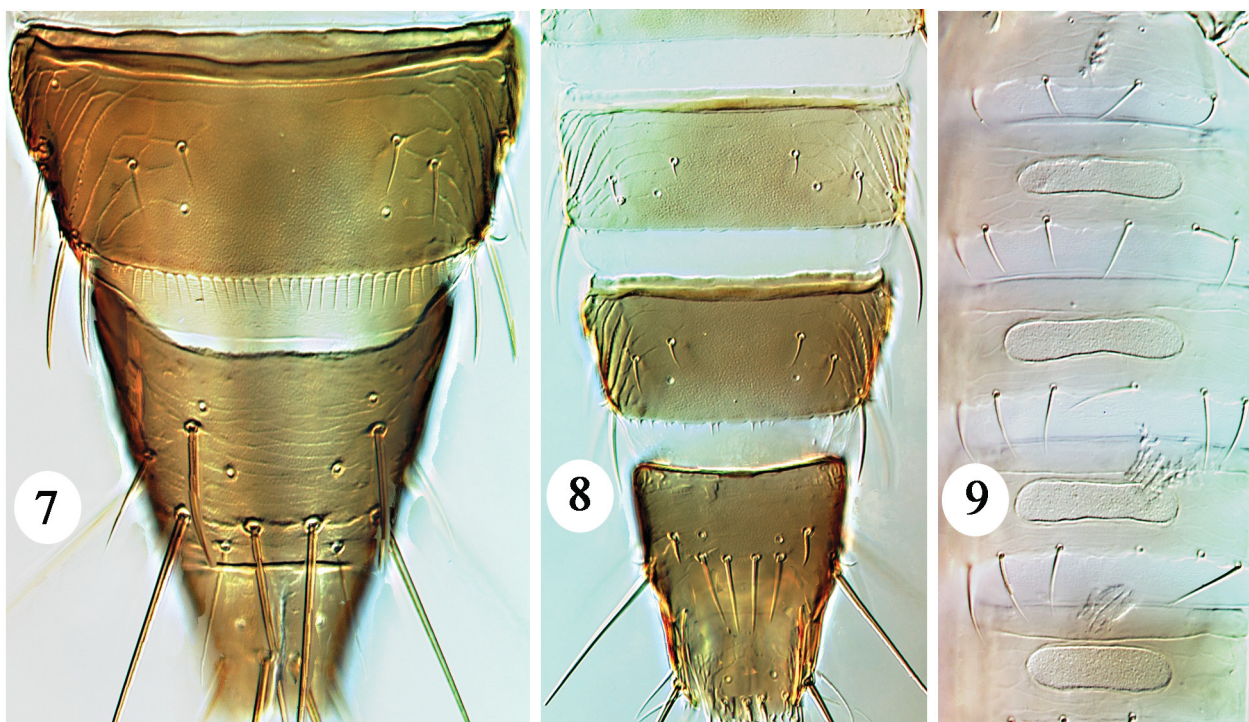
Measurements (holotype female in microns). Body length 1220. Head, length 115; width across cheeks 120; ocellar setae II 37; III 20; postocular setae I 20; II 12; III 37; IV 12; V 20. Pronotum, length 129; width 160; posteroangular setae 60. Fore wing length 700. Antennal segments III–VII length 50, 47, 37, 50, 18.

Male macroptera. Body, legs and antennal segments I–III mainly yellow, head with ocellar region light brown, abdominal segments IV–VII increasingly brown medially, VIII–IX uniformly brown (Fig. 8); mesofurcal spinula present but sometimes weak; metanotum with paired campaniform sensilla; tergal posterior margins smooth, without tooth-like lobes, VIII with comb represented by a few and variable number of short microtrichia (Fig. 8); IX with transverse row of 4 setae, anterior paired campaniform sensilla present or absent; sternites III–VII with transverse pore plates (Fig. 9) that are more than 0.5 of the sternite width.

Measurements (male paratype in microns). Body length 1050. Head, length 95; width across cheeks 115. Fore wing 600. Sternite IV pore plate width 75. Antennal segments III–VII length 47, 45, 35, 47, 15.



FIGURES 1–6. *Stenchaetothrips martini*. Female 1–6: (1) antenna; (2) head & pronotum; (3) Meso & metanotum and tergite I; (4) tergites II–III; (5) hind coxae and sternites I–II; (6) thoracic sternites and mesofurca.



FIGURES 7–9. *Stenchaetothrips martini*. (7) female tergites VIII–X. (8) male tergites VII–IX. (9) male sternites II–VI.

Specimens studied. Female holotype, **New Zealand**, North Island, Muriwai Beach, Quarry Track, 20km West of Auckland, from rolled leaves of *Phyllostachys aurea* [Poaceae, Bambusoideae], 22.iii.2016 (Nicholas Martin), in New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland.

Paratypes: **New Zealand**, 12 females, 4 males collected with holotype; 3 females, same site, host and collector, 23.ii.2016. In NZAC, Auckland; Australian National Insect Collection, CSIRO, Canberra; the Natural History Museum, London; the Senckenberg Museum, Frankfurt. **England**, London, Kew, The Royal Botanic Gardens, 1 female from bamboo, vii.2010, in FERA Science Collection, York, England.

Non-paratype specimens: There are further specimens of both sexes of this species in the FERA Science Collection, York, England [teste Sharon Reid and Mark Delaney]. These are from Kew Gardens with the data given above, and from a commercial nursery at Mundham, Chichester, West Sussex, vii.2002 (identified as *spinalis* by Philippe Reynaud).

Molecular results

The DNA barcoding region of COI gene sequence was obtained from specimens of the same population in New Zealand as the holotype of this new species. Phylogenetic analysis of the available sequences, from BOLD project DNA barcoding thrips of India (Tyagi *et al.* 2017) and GenBank, for four *Stenchaetothrips* species revealed that *martini* is well separated from *spinulae*. This result supported the morphological observations that *martini* is different from *S. spinulae*. The phylogenetic tree also showed that *S. martini* is far distant from *pteratus*, and closer to but different from *biformis* (Fig. 10). However, no DNA sequence data are available from other *Stenchaetothrips* species, and relationships within the genus remain unresolved, and will require comparisons using further species and genes.

Comparisons

This new species is very similar in structure to the other three species of *Stenchaetothrips* that are known from bamboo and that have a mesothoracic furca. However, in contrast to both *spinulae* and *spinalis*, *martini* has

metanotal campaniform sensilla present, a condition it shares with *gaomiaoensis*. From *spinulae* and *spinalis* it also differs in having ocellar setae pair III outside the ocellar triangle instead of just inside or on the margins, and the males of *spinulae* have tergites VI–VII more uniformly brown than in *martini*, and relatively smaller sternal pore plates that are less than 0.3 of the width of a sternite. The available females of *spinalis* cannot at present be distinguished from the description of *spinulae*, and in the absence of males of *spinalis* it is not possible to make further comparisons. However, *gaomiaoensis* differs from *martini* in having males with the abdomen uniformly brown, and sternal pore plates that are scarcely 0.3 as wide as the sternites, and the females have antennal segment IV yellow, and the major setae on the head shorter. Of the other species of this genus on which a mesothoracic furca has been reported, *tenebricus* differs in that the male is described as brown, with no pore plate on sternite VII, and tergite VIII with a complete comb (Tyagi & Kumar 2008); *biformis* has the fore wing uniformly shaded, and the males with a series of laterally directed teeth on the posterior margins of the tergites; the male of *brochus* has tergites similar to those of male *biformis* but with the fore wing pale at the base, and *karnyanus* also has uniformly brown fore wings as in *biformis*.

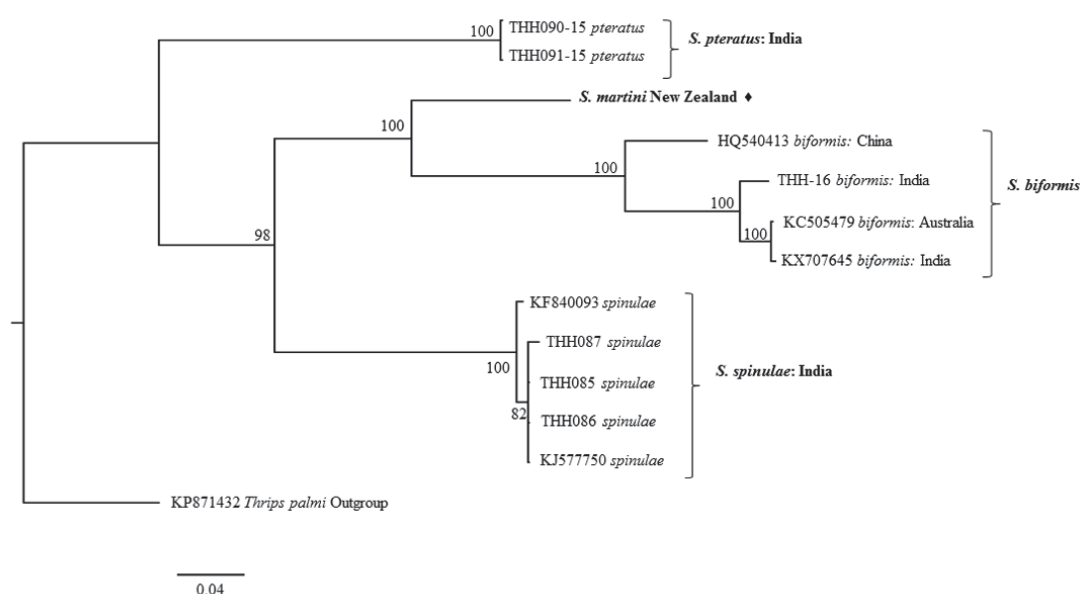


FIGURE 10. Bayesian phylogenetic tree inferred from sequences of the COI gene of *Stenchaetothrips* spp. Posterior probabilities greater than 50% are given on appropriate clades. Species name, origin and GenBank Accession number or BOLD ID are listed for each taxon. *S. martini* is in BOLD and marked with a diamond.

Considering the contradictions indicated in the Introduction above, and the statement by Bhatti (1982) that the presence of metanotal campaniform sensilla, and the presence of a mesothoracic furca, are both variable in some *Stenchaetothrips* species, there must remain doubts concerning the validity of some named species in this genus. Many are known from few specimens, whereas for the only common species, *biformis*, considerable variation in structure within and between populations has been documented (Bhatti 1982; Vierbergen 2004; Mound 2011). Species level taxonomy in the genus therefore needs confirmation through studies on host-plant associations and intra- and inter-population structural variation, together with support from molecular data. In this connection, and after this paper was accepted for publication, we were informed by Philippe Reynaud (4.ix.2017) that he has seen this new species from *Phyllostachys aurea* at three areas in southwestern France at various times between 1999 and 2014. Moreover, he indicated that this thrips is likely to have been taken in other countries in Europe, including Germany and The Netherlands. Samples from France included a few individuals with no metanotal campaniform sensilla, thus further emphasising that variation is to be expected within *Stenchaetothrips* species.

The presence of microtrichia on the upper surface of the hind coxae is a character that has been noted previously only among species of *Frankliniella*. In that genus, some closely similar species such as *panamensis* and *occidentalis*, have been shown to differ in the state of this character (Gunawardana *et al.* 2017). During the

present study, a total of 13 species of *Stenchaetothrips* have been examined, and a group of microtrichia on the upper surface of the hind coxae has been observed in each of these, including *spinalis*. However, the number and size of the microtrichia varies between species, with the fewest and smallest being noted in *biformis* and *indicus*, and the most prominent in a paratype female of *amamiensis*.

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